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Submitted for recognition as an American National Standard

ALUMINUM SHEET, LAMINATED  
Surface Bonded

1. SCOPE:

1.1 Form: This specification covers aluminum and aluminum alloy foil in the form of laminated sheet.

1.2 Application: Primarily for shims in which thickness is to be adjusted by removal of laminations as required.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

AMS 4016 - Aluminum Alloy Sheet and Plate, 2.5Mg - 0.25Cr (5052-H32), Strain Hardened, Quarter-Hard, and Stabilized

AMS 4017 - Aluminum Alloy Sheet and Plate, 2.5Mg - 0.25Cr (5052-H34), Strain Hardened, Half-Hard, and Stabilized

AMS 4041 - Aluminum Alloy Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024 and 1-1/2% Alclad 2024, -T3 Flat Sheet; 1-1/2% Alclad 2024-T351 Plate)

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 660 - Packaging/Packing of Aluminum and Magnesium Products

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### 3. TECHNICAL REQUIREMENTS:

#### 3.1 Composition:

3.1.1 Laminations: Shall be 1100, 1145, 3003, or 5052 aluminum alloy foil. The choice of alloy shall be at the discretion of the producer unless a specific alloy is specified by purchaser.

3.1.2 Solid Base: Shall be AMS 4041 aluminum alloy sheet, except that when  
Ø laminations are 5052 aluminum alloy foil the base shall be AMS 4016 or AMS 4017 aluminum alloy sheet.

3.1.3 Adhesive: Shall be a composition which will meet the fabrication and quality requirements of 3.2, 3.3, and 3.4.

3.2 Fabrication: Laminated shim stock shall be fabricated from hard or extra hard laminations, in combination with a solid base, when required. Laminations shall be 0.0030 inch,  $\pm 0.0003$  (0.076 mm  $\pm 0.008$ ) thick unless thickness of 0.0020 inch + 0.0002 (0.051 mm + 0.005) is specified. Laminations shall be bonded together throughout the surface area by an adhesive which will permit peeling of layers for adjustment of shim thickness. The thickness of each layer of adhesive shall not exceed 0.0003 inch (0.008 mm).

3.2.1 Laminations and solid base when applicable, shall be bonded together  
Ø throughout the surface area in a manner which will permit peeling of laminations without the aid of mechanical devices and without separation of the remaining laminations and solid part. Laminations shall be bonded together so that any shape can be cut from the material using suitable tools, without separation. Material shall remain intact without separation during normal handling. Requirements shall be applicable to laminations not less than eight hours after completion of bonding.

3.2.2 Surface Roughness: Flat surfaces of laminations, and solid stock when  
Ø applicable, shall have a maximum roughness of 63 RA (microinches) on original surfaces and on metallic surfaces after peeling.

3.2.3 Water Resistance: Sheet shall withstand immersion in tap water at 120°F  $\pm 5$  (49°C  $\pm 3$ ) for not less than 3 hours without separation of laminations or any evidence of corrosion.

3.3 Sizes: Sheet shall be of the thicknesses and combinations of laminations  
Ø and solid base specified in Table 1.

TABLE I

## Laminations

Nominal Thickness Of Shim Stock Inch mm	All Laminated, 0.002 inch (0.05 mm)	All Laminated, 0.003 inch (0.08 mm)	Half	Half	Three -	Three -
			Solid, Half Laminated 0.002 inch (0.05 mm)	Solid, Half Laminated 0.003 inch (0.08 mm)	Quarters Solid, One Quarter Laminated 0.002 inch (0.05 mm)	Quarters Solid, One Quarter Laminated 0.003 inch (0.08 mm)
0.006 0.15	X					
0.008 0.20	X					
0.010 0.25	X					
0.012 0.30	X					
0.015 0.38	X	X				
0.016 0.41	X	X				
0.020 0.51	X	X				
0.021 0.53	X	X				
0.032 0.81	X	X				
0.033 0.84	X	X				
0.047 1.19	X	X				
0.048 1.22	X	X				
0.062 1.58	X	X	X	X		
0.063 1.60	X	X	X	X		
0.078 1.98	X	X	X	X		
0.080 2.03	X	X	X	X		
0.093 2.36	X	X	X	X		
0.094 2.39	X	X	X	X		
0.109 2.77	X	X	X	X		
0.121 3.07	X	X	X	X	X	X
0.125 3.18	X	X	X	X	X	X

3.4 Quality: Sheet, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from dents, creases, and other imperfections detrimental to usage of the sheet.

3.5 Tolerances: Shall be as specified in Table II.

TABLE II

Nominal Total Thickness Inch	Tolerance, Inch	
	Plus	Minus
Up to 0.008, incl	0.001	0.0005
Over 0.008 to 0.010, incl	0.0015	0.0005
Over 0.010 to 0.016, incl	0.0015	0.001
Over 0.016 to 0.021, incl	0.002	0.001
Over 0.021 to 0.033, incl	0.003	0.002
Over 0.033 to 0.048, incl	0.005	0.002
Over 0.048 to 0.063, incl	0.006	0.002
Over 0.063 to 0.080, incl	0.007	0.002
Over 0.080 to 0.094, incl	0.009	0.003
Over 0.094 to 0.109, incl	0.010	0.003
Over 0.109 to 0.125, incl	0.012	0.003
Over 0.125 to 0.156, incl	0.015	0.003
Over 0.156 to 0.187, incl	0.018	0.003
Over 0.187 to 0.190, incl	0.018	0.005

TABLE II (SI)

Nominal Total Thickness Millimeters	Tolerance, Millimeter	
	Plus	Minus
Up to 0.20, incl	0.025	0.013
Over 0.20 to 0.25, incl	0.038	0.013
Over 0.25 to 0.41, incl	0.038	0.03
Over 0.41 to 0.53, incl	0.05	0.03
Over 0.53 to 0.84, incl	0.08	0.05
Over 0.84 to 1.22, incl	0.13	0.05
Over 1.22 to 1.60, incl	0.15	0.05
Over 1.60 to 2.03, incl	0.17	0.05
Over 2.03 to 2.39, incl	0.23	0.08
Over 2.39 to 2.77, incl	0.25	0.08
Over 2.77 to 3.18, incl	0.30	0.08
Over 3.18 to 3.96, incl	0.38	0.08
Over 3.96 to 4.75, incl	0.46	0.08
Over 4.75 to 4.83, incl	0.46	0.13

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of sheet shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the sheet conforms to the requirements of this specification.
- 4.2 Classification of Tests: Tests for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.